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What and why GIS?
Uses for community mapping

Dr. Melinda Laituri
Secondary Cities Principal Investigator

2C Esmeraldas Project Initial Workshop
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Quito and Esmeraldas, Ecuador

Understanding of Places

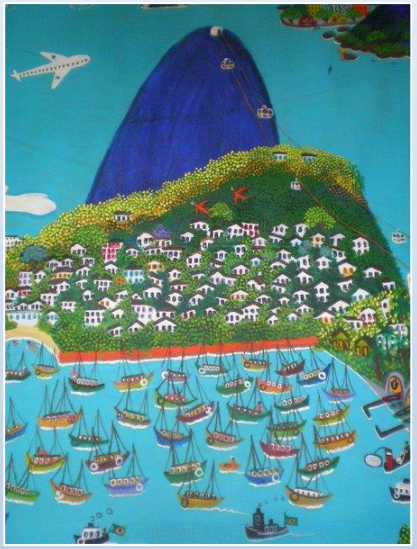
- Everything happens somewhere
- PLACE and LOCATION (e.g. CONTEXT)
- Geography is the stage upon which history takes place
- Place name geography is to geography as the alphabet is to literature
- Yes, it's about where things are, but it's also: **what's there and so what?**

GIScience: Spatial Thinking

- Relationships among things; Location as anchor
- Spatial cognition
- Spatial reasoning
- Spatial literacy

Wayfinding

Route knowledge



Naïve geography/ cognitive maps

What and Why GIS?

GIS: System or science

Tools, data repository, resource, problem solving, decision making

Importance of know where things are and why

Data + Software + Analysis = “Smart Maps”

GIS as a coordinated system

Data
Algorithms
Display
Management
People

→ Hardware
Software
Geographic data

→ Visualization
Analysis

→ Georeferenced: attributes
Layers of information

The Information Process

- Data: collection of observations and measurements about the real world
- Information: modeling and analysis of data
- Knowledge: Interpretation and understanding of information to inform decisions
- Wisdom: Experience

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Information Management Strategy

Clear definition of problem

- Set priorities

Assessment of data

- Review existing data

Assessment of available resources

Analysis procedures

- Flowcharting

Documentation

Output

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DATA GENERATION

Data generation of Human Geography thematic areas for 2C projects:

-Language
-Land Use
-Health
-Religion
-Significant Events
-Transportation
-Water Supply
-Communications and Media
-Demographic and Human Populations
-Economy
-Education
-Social Groups
-Organizations

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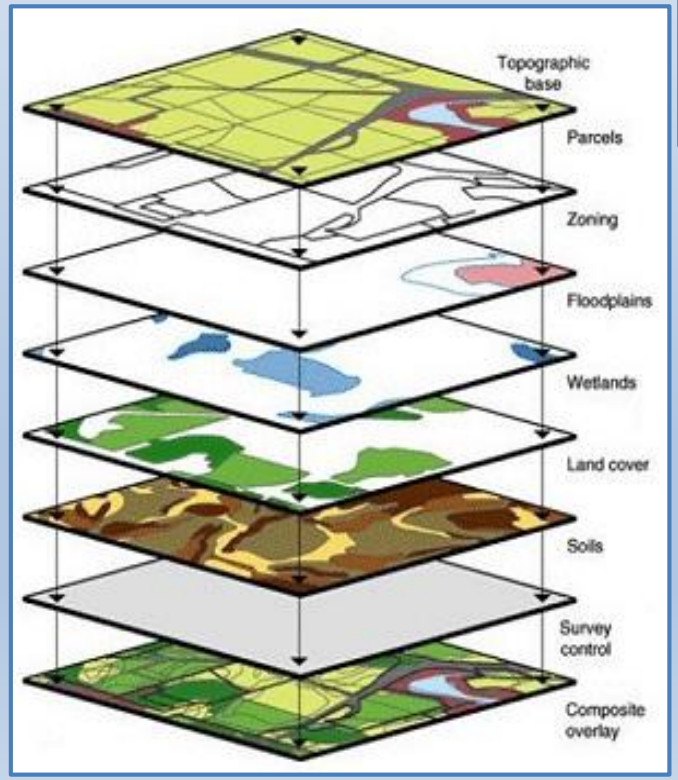
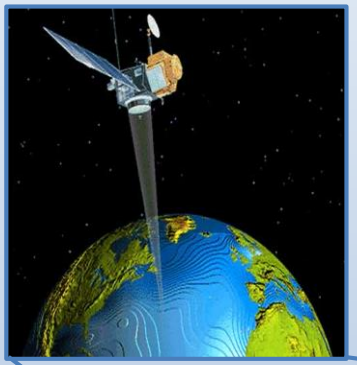
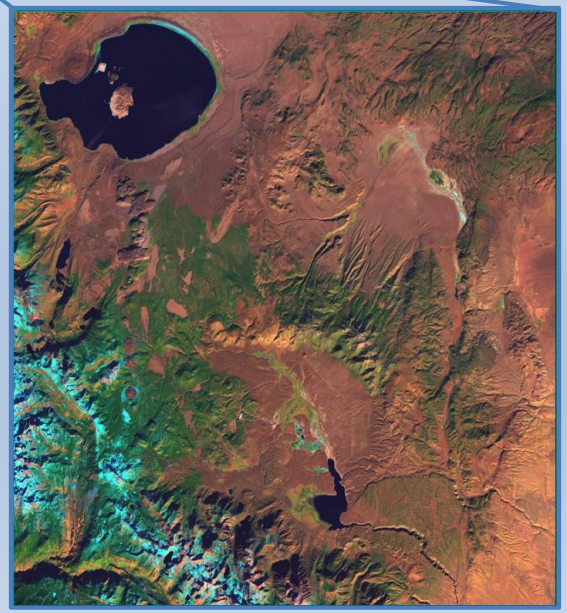
What is Geospatial Science?
Geospatial Technologies

Geographic Information System (GIS)

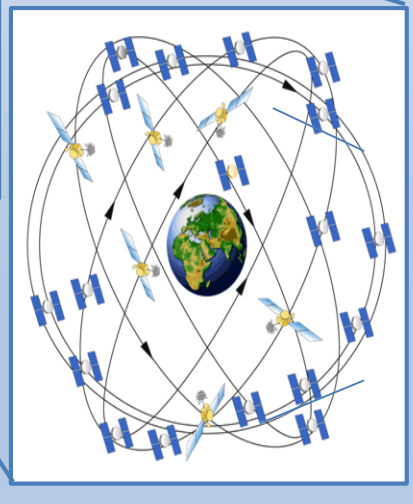




Remote Sensing (RS)



Global Positioning System (GPS)



New tools for data collection

- Phones, tablets, drones (UAVs)

New approaches

- Citizen Science initiatives
- Crowd mapping: Mapathons

Visualization --Communicating with Maps: Key Cartographic concepts

Scale

- What shall be seen and not seen?

Projection

- What shall be distorted?

Legend

- What is being mapped?

Symbolization

- What story is told?

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Scale:

Working across multiple scales

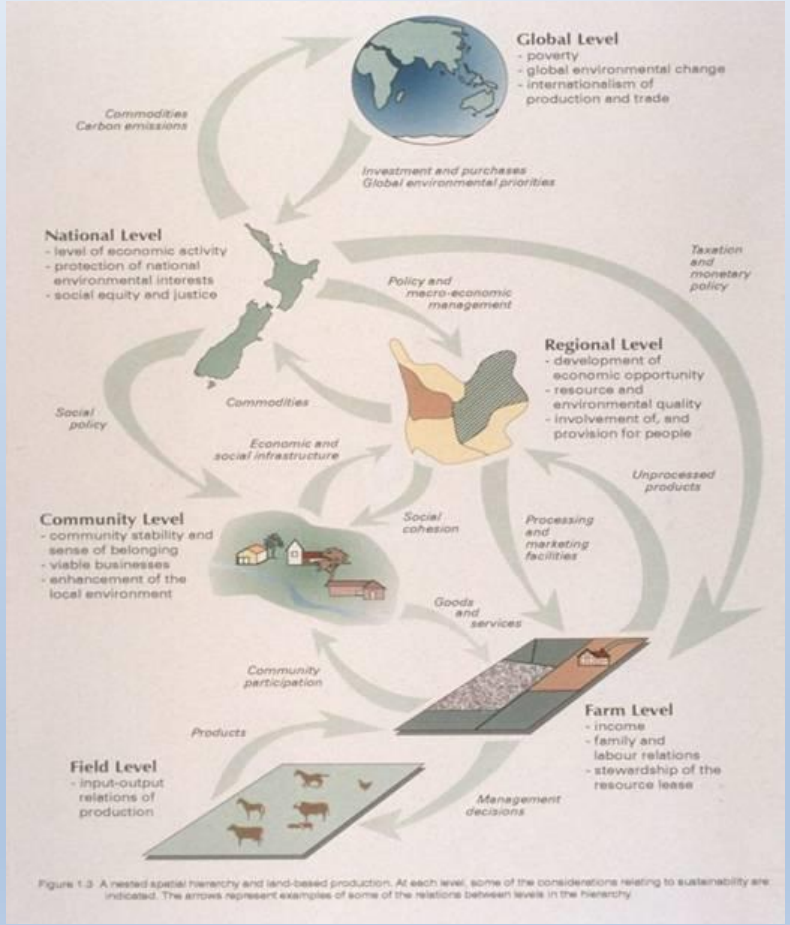


Figure 1.3 A nested spatial hierarchy and land-based production. At each level, some of the considerations relating to sustainability are indicated. The arrows represent examples of some of the relations between levels in the hierarchy

GIS as an Integrative Tool

- Spatial thinking and spatial literacy
- Establish common/similar sites
  - Data collection for comparison and identifying interaction
  - Expectation of shared/common database
- Multiple scales
  - Time and space
- Multiple boundaries
  - Inter-relationships
- GIS models
  - Integrated database/Overlay analysis/Map algebra
- Geovisualization
  - Interactive maps/3-D products
- Transform data to information

Spatial Analysis

- Distance and directional analysis
- Geometrical processing
- Map algebra
- Grid models
- Spatial statistics, spatial autocorrelation, spatial regression
- Surface analysis
  - Surface form and flow analysis
  - Gridding and interpolation methods
  - Visibility analysis
- Network and locational analysis
  - Shortest path calculation
  - Travelling salesman problems
  - Facility location
  - Arc routing
- Geocomputational methods
  - Agent-based modelling
  - Artificial neural networks
  - Evolutionary computing

John Snow, Broad Street cholera outbreak, 1854
Source: Wikipedia

John Snow's Cholera Map of London, 1854

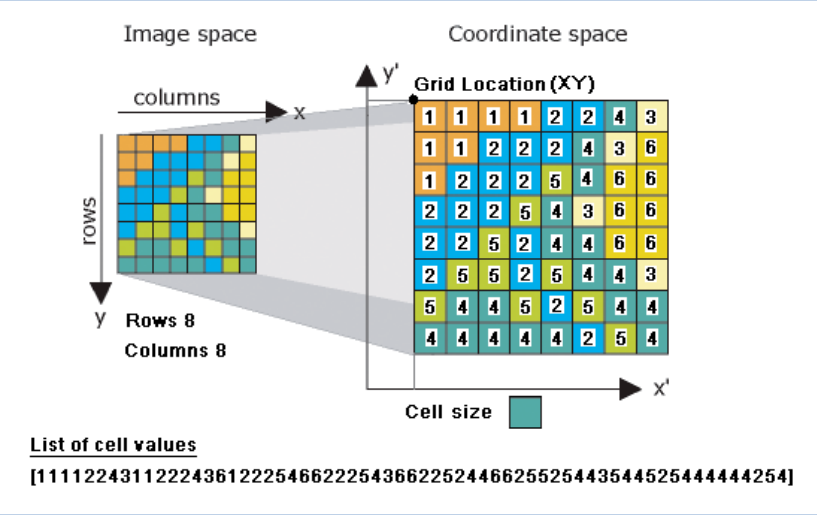
Basic Approach

- Data: get it
- Analysis: do it
- Visualization: show it

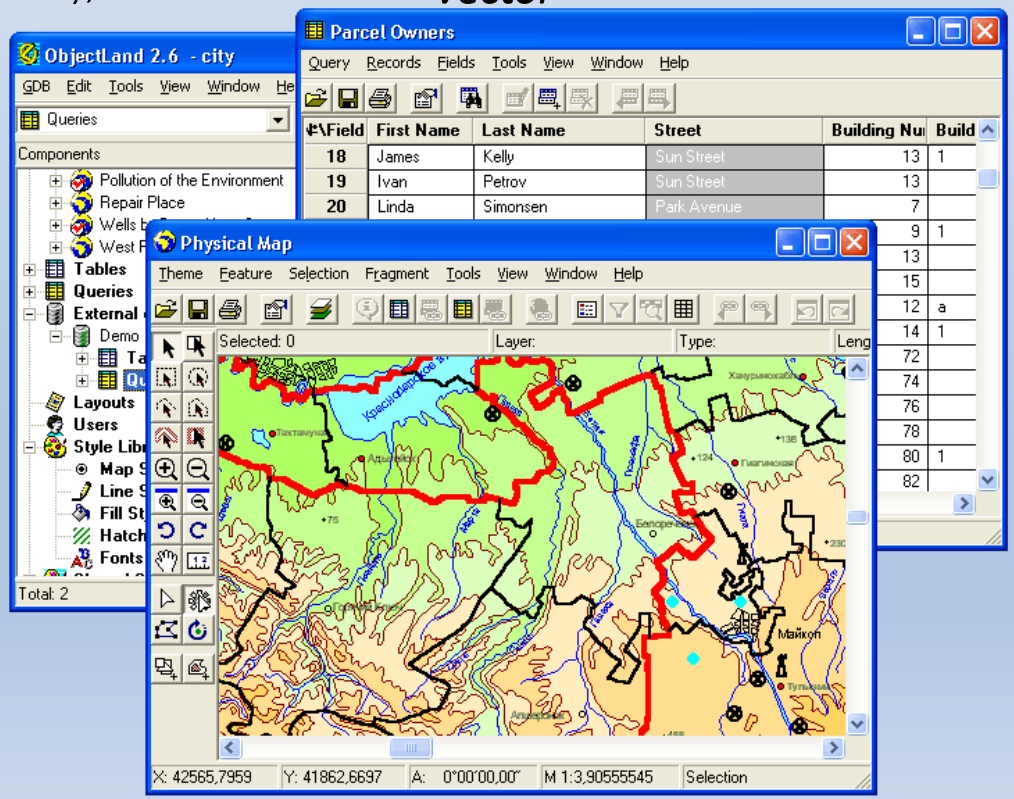
Data: get it

- Determine what you need
- Determine if it exists; where to find it
- Types: base vs. thematic
- Types: points, lines, polygons (vector), rasters
- Attributes

Raster



Vector



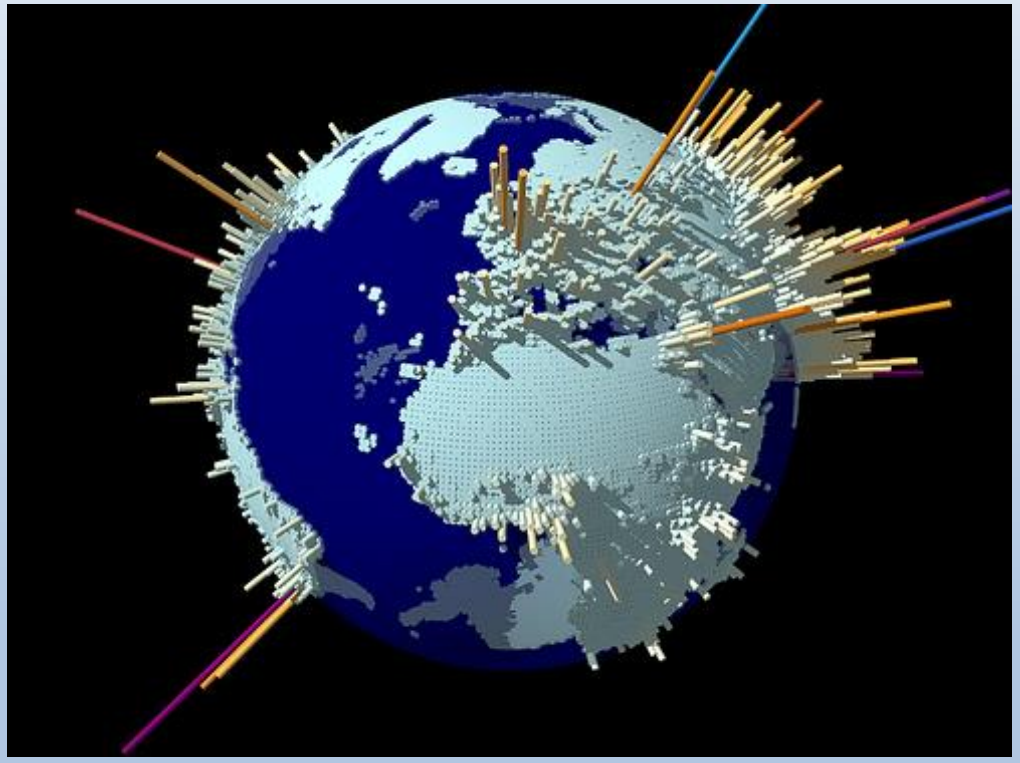
Analysis: do it

- Look for patterns; collect/make measurements
- Quantitative and qualitative observations
- Simple distance, buffer, routes
- Complex mathematical (spatial statistics)
- Modeling

Raster outputs – Mt St Helens

Visualization: show it

- Tell your story
- It's often easier to SHOW than explain



Population Density (January 30, 2007)
http://gecon.yale.edu/ -- Geographically based economic data

- **Visit:** The Geospatial Revolution: http://geospatialrevolution.psu.edu/trailer.php

"Global issues, such as biodiversity loss, urban sprawl, energy needs, water quality and availability, natural hazards, and human health, are becoming increasingly complex and···affect our everyday lives. Moreover, they all have a spatial component. To grapple with these issues for the 21st century ***requires*** *a populace that's adept at using GIS and other geotechnologies."*

GIS as a Research Approach

- Setting research question
- Spatially Explicit
- Spatial Thinking

- Geospatial Technologies for Data Collection
- Geospatial Tools for Analysis and Visualization

Examples

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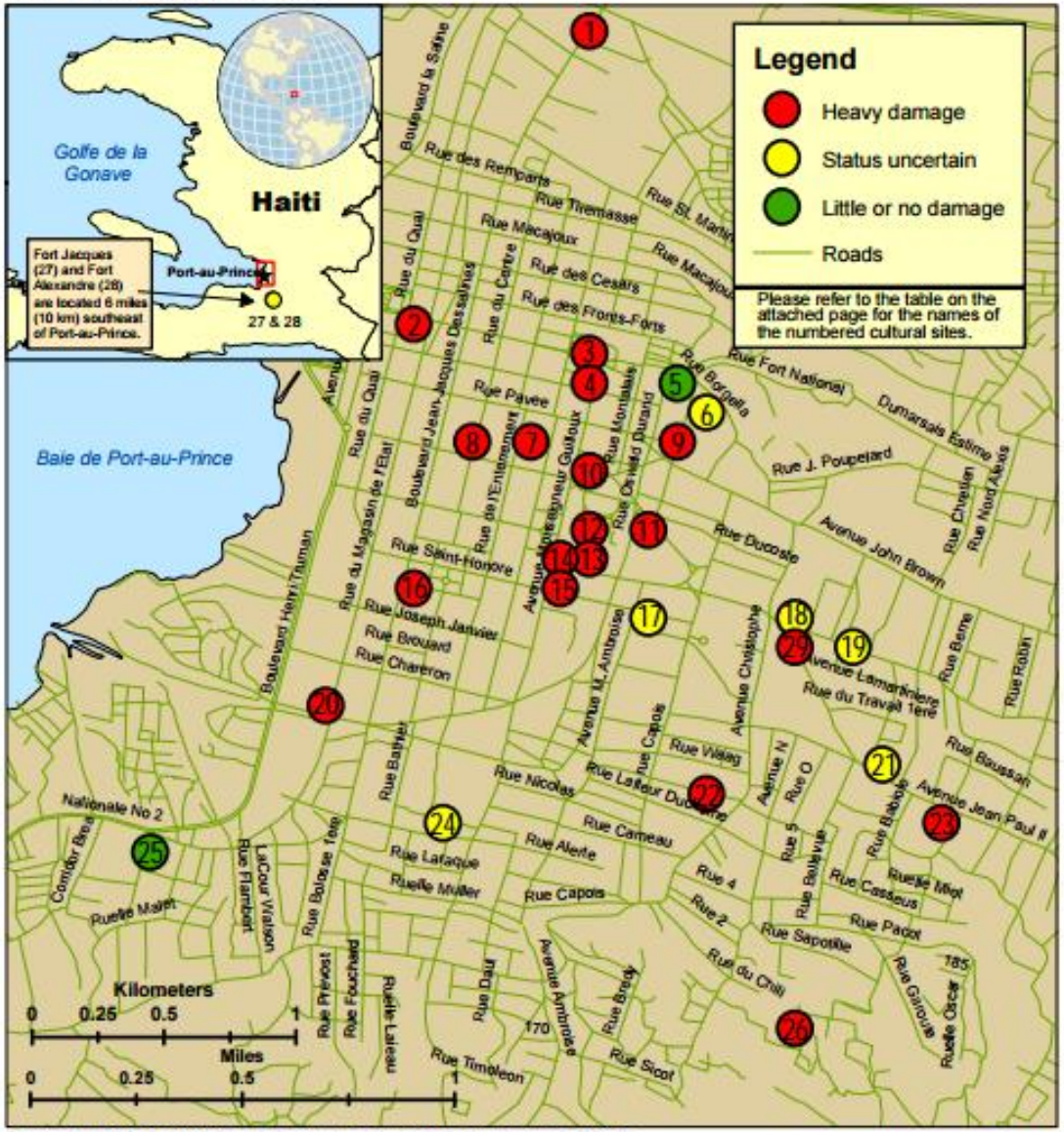
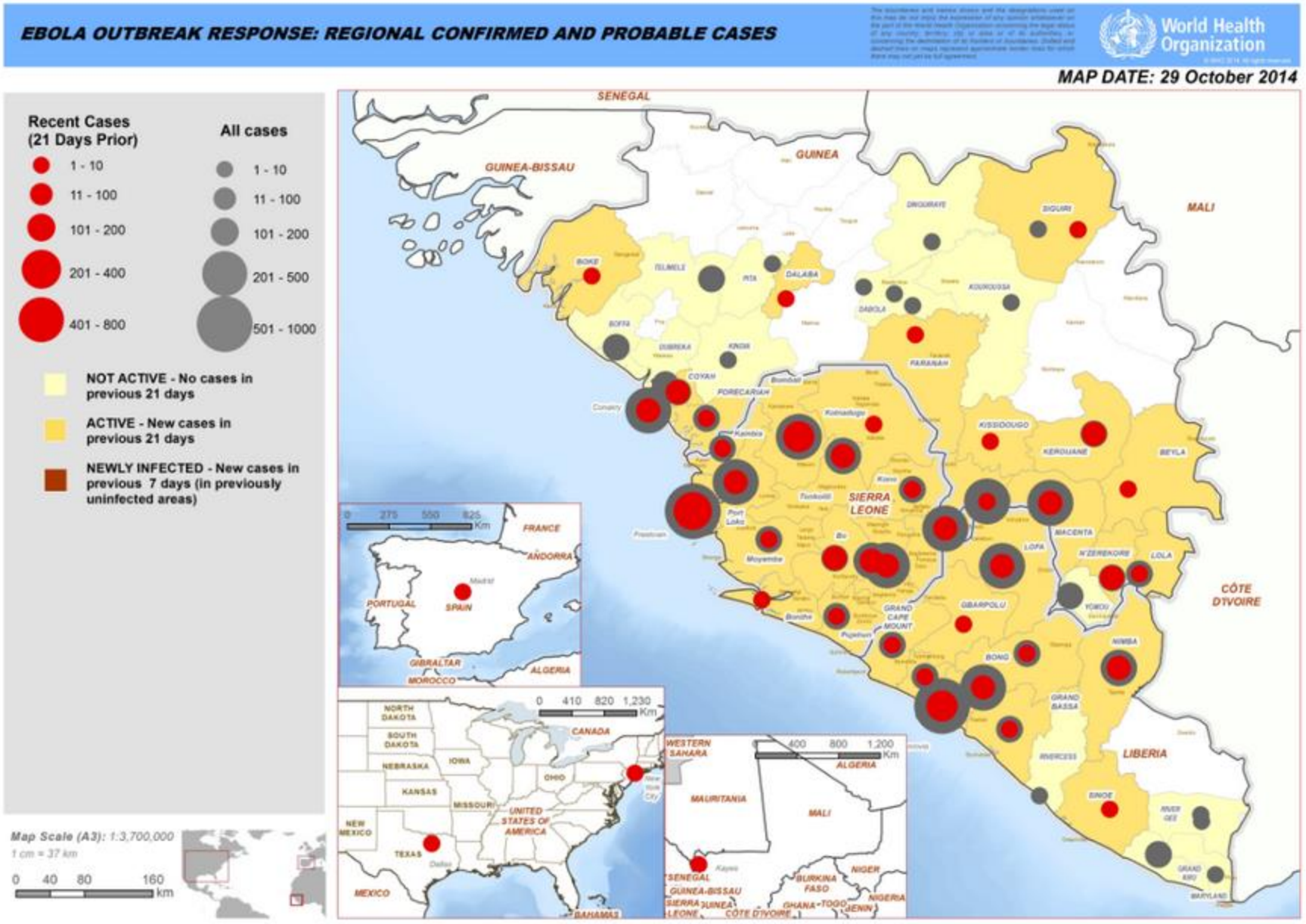
U.S. Department of State
hiu_info@state.gov
http://hiu.state.gov

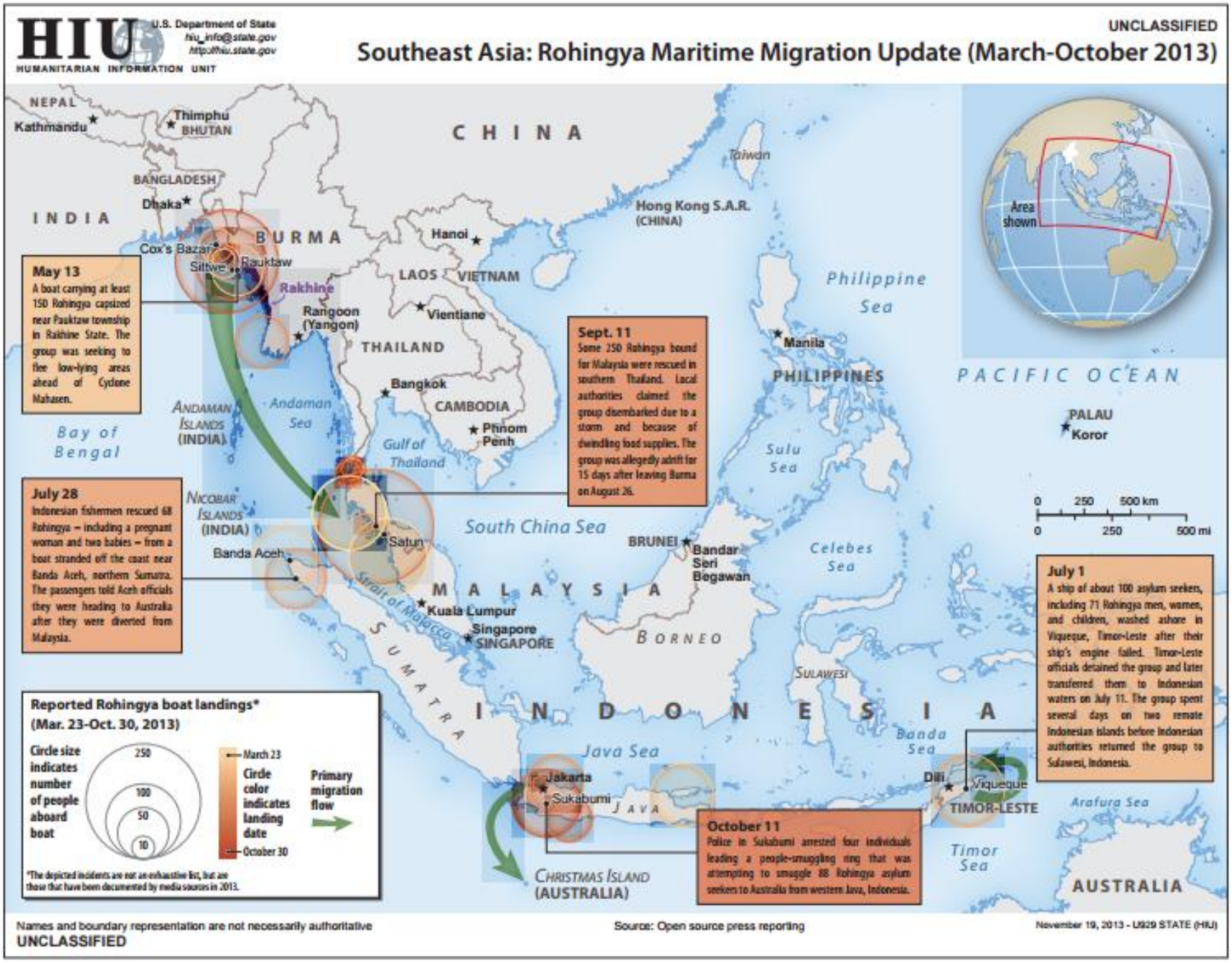
Haiti: Damage Assessment of Selected Cultural Sites in and near Port-au-Prince



Sources: UNOSAT, CNN, World Monuments Fund, U.S. Department of State

February 23, 2010 - U129 STATE (HIU)


EBOLA OUTBREAK RESPONSE: REGIONAL CONFIRMED AND PROBABLE CASES
World Health Organization
MAP DATE: 29 October 2014
Recent Cases (21 Days Prior)
1 - 10
11 - 100
101 - 200
201 - 400
401 - 800
All cases
1 - 10
11 - 100
101 - 200
201 - 500
501 - 1000
NOT ACTIVE - No cases in previous 21 days
ACTIVE - New cases in previous 21 days
NEWLY INFECTED - New cases in previous 7 days (in previously uninfected areas)
Map Scale (A3): 1:3,700,000
1 cm = 37 km
0 40 80 160 km
SENEGAL
GUINEA
GUINEA-BISSAU
MALI
SIERRA LEONE
LIBERIA
CÔTE D'IVOIRE
FRANCE
ANDORRA
PORTUGAL
SPAIN
GIBRALTAR
MOROCCO
ALGERIA
CANADA
UNITED STATES OF AMERICA
MEXICO
BAHAMAS
WESTERN SAHARA
MAURITANIA
BURKINA FASO
NIGER
NIGERIA
GHANA
TOGO
BENIN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U.S. Department of State
hiu_info@state.gov
http://hiu.state.gov
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Southeast Asia: Rohingya Maritime Migration Update (March-October 2013)
NEPAL
Kathmandu
Thimphu
BHUTAN
CHINA
Taiwan
BANGLADESH
Dhaka
INDIA
Hong Kong S.A.R. (CHINA)
BURMA
Hanoi
Cox's Bazar
Sittwe
Rauktaw
Rakhine
LAOS
VIETNAM
Philippine Sea
Rangoon (Yangon)
Vientiane
THAILAND
Manila
PHILIPPINES
PACIFIC OCEAN
Bangkok
CAMBODIA
Andaman Sea
ANDAMAN ISLANDS (INDIA)
Bay of Bengal
Phnom Penh
PALAU
Koror
Gulf of Thailand
Sulu Sea
NICOBAR ISLANDS (INDIA)
South China Sea
Satun
BRUNEI
Bandar Seri Begawan
Celebes Sea
Banda Aceh
Strait of Malacca
MALAYSIA
Kuala Lumpur
Singapore
SINGAPORE
BORNEO
SUMATRA
SULAWESI
INDONESIA
Java Sea
Banda Sea
Jakarta
Sukabumi
JAVA
Dili
Viqueque
TIMOR-LESTE
Arafura Sea
Timor Sea
CHRISTMAS ISLAND (AUSTRALIA)
AUSTRALIA
Area shown
0 250 500 km
0 250 500 mi
May 13
A boat carrying at least 150 Rohingya capsized near Pauktaw township in Rakhine State. The group was seeking to flee low-lying areas ahead of Cyclone Mahasen.
Sept. 11
Some 250 Rohingya bound for Malaysia were rescued in southern Thailand. Local authorities claimed the group disembarked due to a storm and because of dwindling food supplies. The group was allegedly adrift for 15 days after leaving Burma on August 26.
July 28
Indonesian fishermen rescued 68 Rohingya – including a pregnant woman and two babies – from a boat stranded off the coast near Banda Aceh, northern Sumatra. The passengers told Aceh officials they were heading to Australia after they were diverted from Malaysia.
July 1
A ship of about 100 asylum seekers, including 71 Rohingya men, women, and children, washed ashore in Viqueque, Timor-Leste after their ship's engine failed. Timor-Leste officials detained the group and later transferred them to Indonesian waters on July 11. The group spent several days on two remote Indonesian islands before Indonesian authorities returned the group to Sulawesi, Indonesia.
October 11
Police in Sukabumi arrested four individuals leading a people-smuggling ring that was attempting to smuggle 88 Rohingya asylum seekers to Australia from western Java, Indonesia.
Reported Rohingya boat landings*
(Mar. 23-Oct. 30, 2013)
Circle size indicates number of people aboard boat
250
100
50
10
March 23
Circle color indicates landing date
October 30
Primary migration flow
*The depicted incidents are not an exhaustive list, but are those that have been documented by media sources in 2013.
Names and boundary representation are not necessarily authoritative
UNCLASSIFIED
Source: Open source press reporting
November 19, 2013 - U929 STATE (HIU)

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Burma 2010 Election Results

U.S. Department of State
hiu_info@state.gov
http://hiu.state.gov
HIU
HUMANITARIAN INFORMATION UNIT

One small step for democracy?

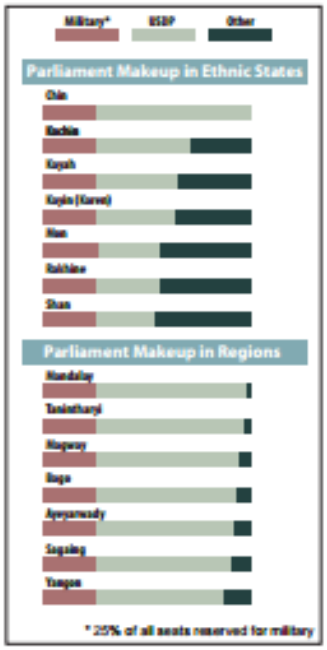
Amid allegations of election irregularities, including ballot stuffing, coercion, fraud, intimidation, and violence (see Burma 2010 Election Irregularities, page 2), the regime-backed Union Solidarity and Development Party (USDP) won national, regional, and state elections.

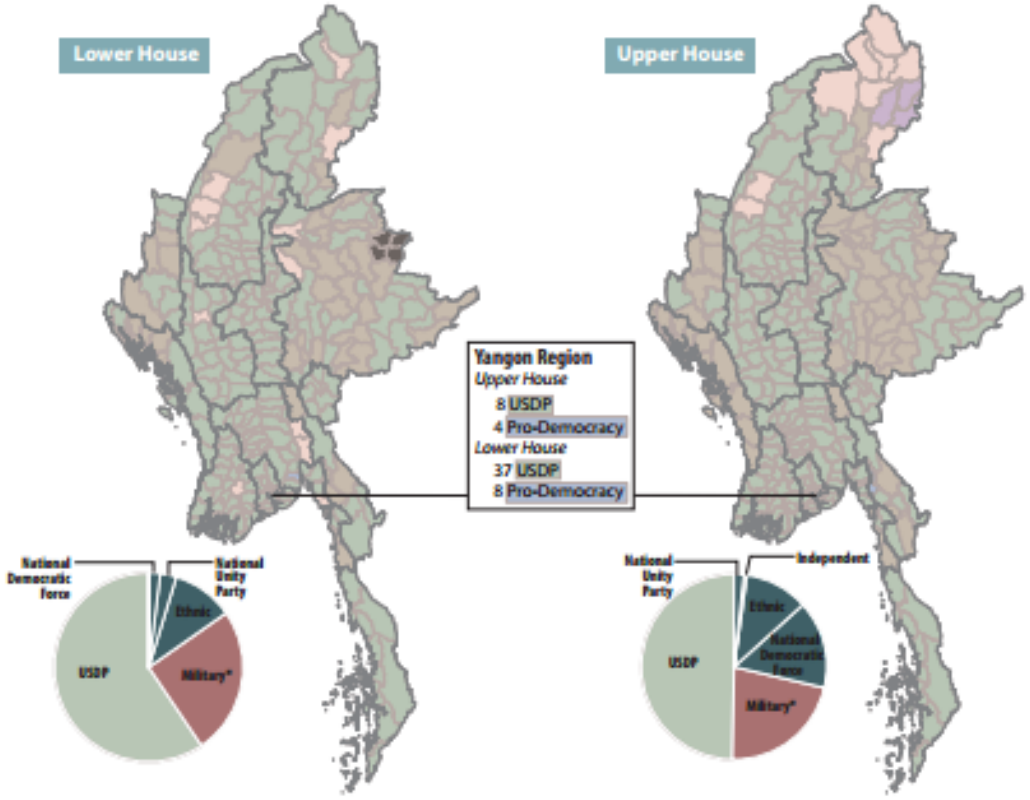
Despite USDP using election apparatus and military force to manipulate votes, some people voted for the party of their choice. Ethnic states in particular voted for non-USDP candidates (see table below).

National Parliament election results, 2010*

	USDP	Ethnic	Pro-Democracy	National Unity Party	Independent	Canceled
People's Parliament (Lower House)	258	47	9	12	0	4
Nationalities Parliament (Upper House)	129	26	7	5	1	0

* The military appoints 25% of all seats to its soldiers: 56 additional seats in the Nationalities Parliament, 110 additional seats in the People's Parliament





Names and boundary representation are not necessarily authoritative.

Sources: Democratic Voice of Burma, Burma News International, Irrawaddy, International Crisis Group, AltASEAN.org

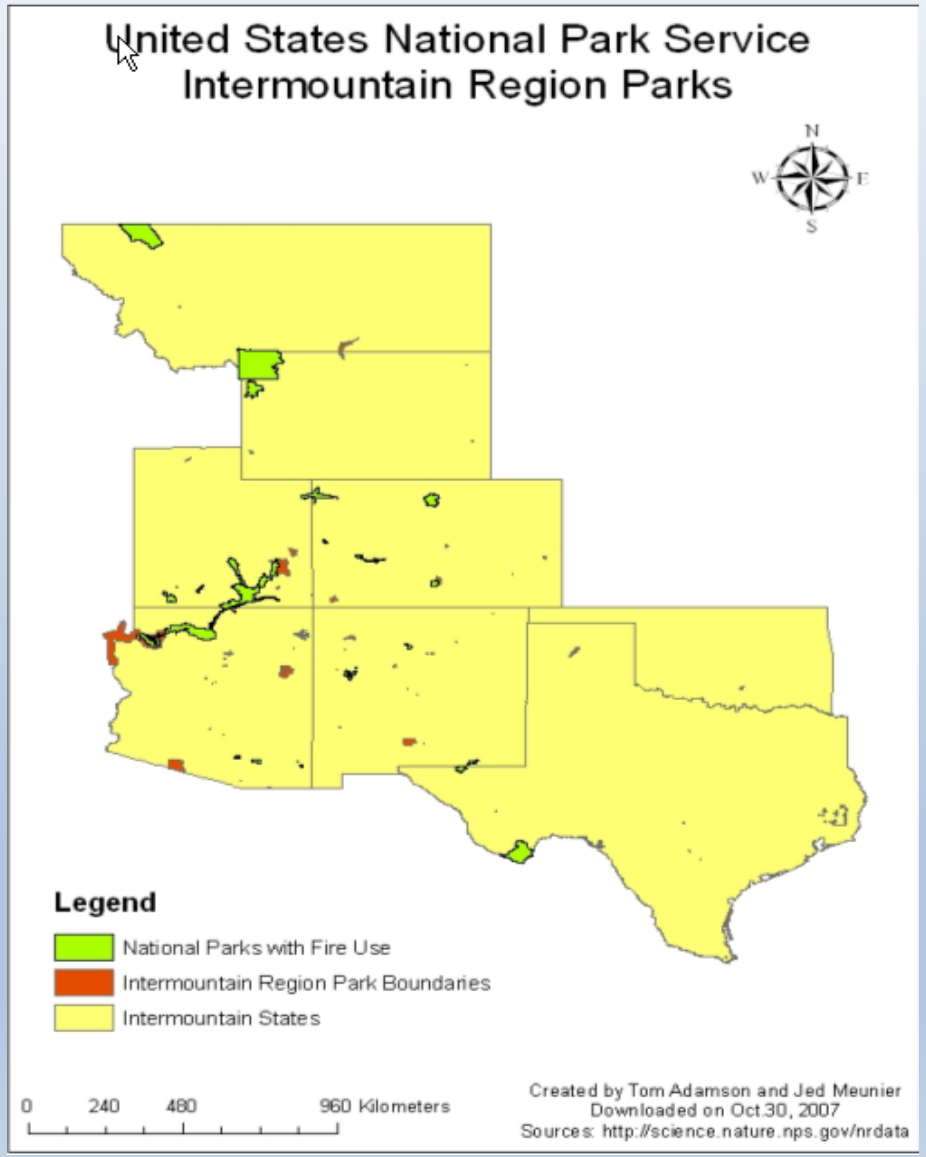
March 26, 2012 - US53 STATE (HIU)

Example GIS Project

- Fire use for natural resource management in Colorado National Monument
  - Compare areas susceptible to wildfire
- Variables: Fire management plans and designated fire areas

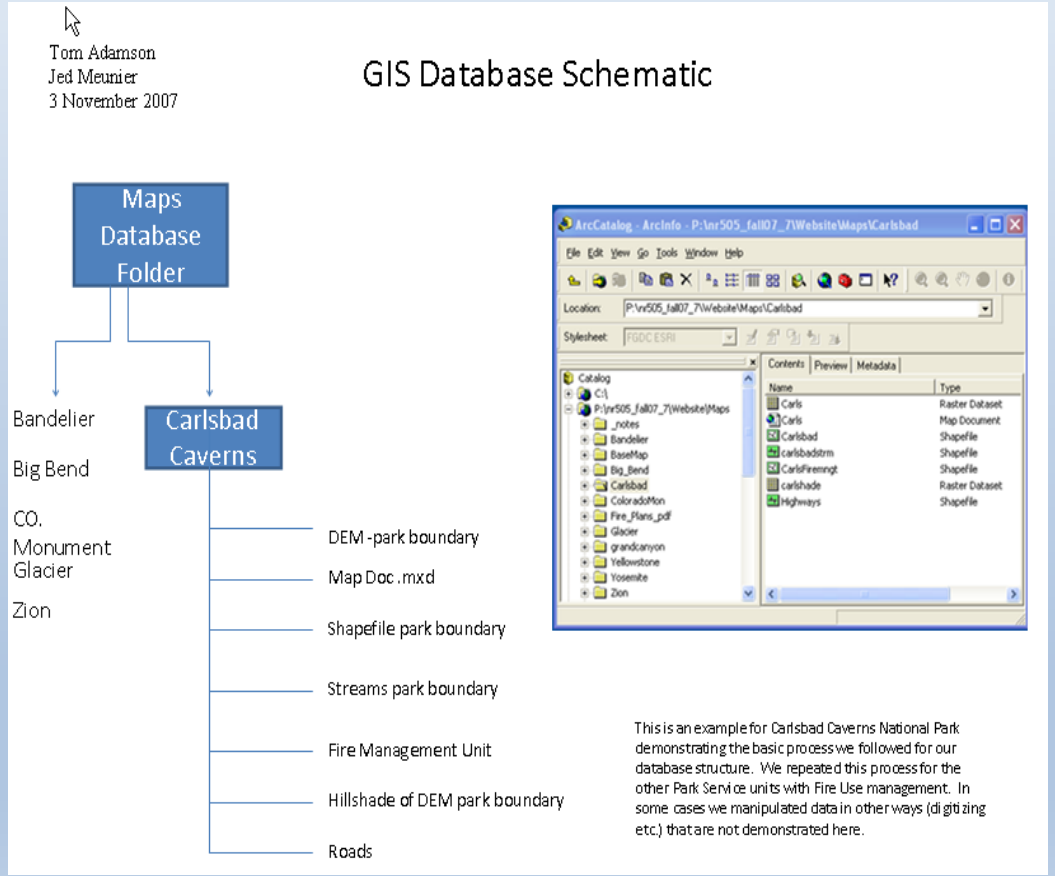
Study Site

Includes locational map and base map of study site

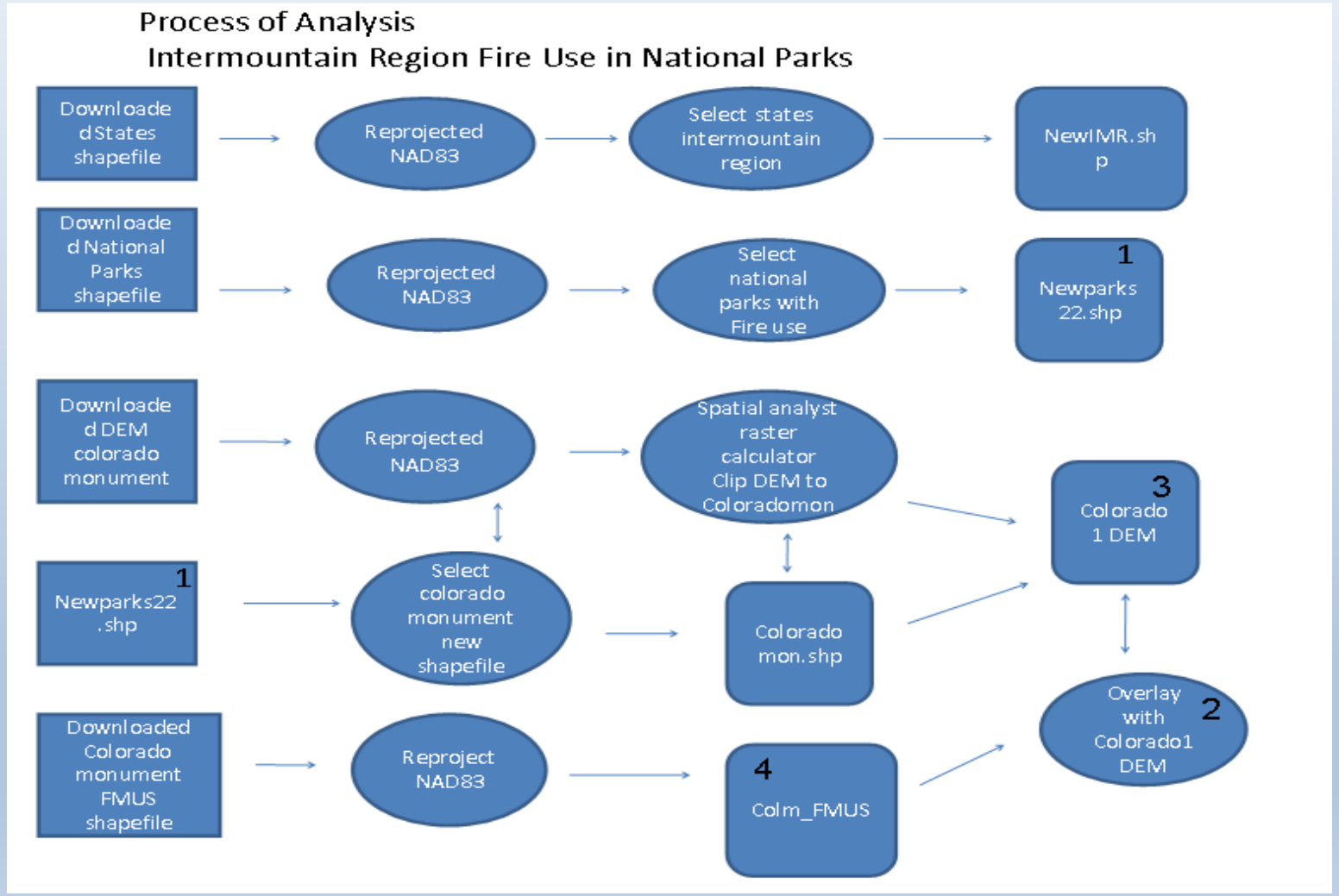


Database organization

- Naming conventions
- Metadata



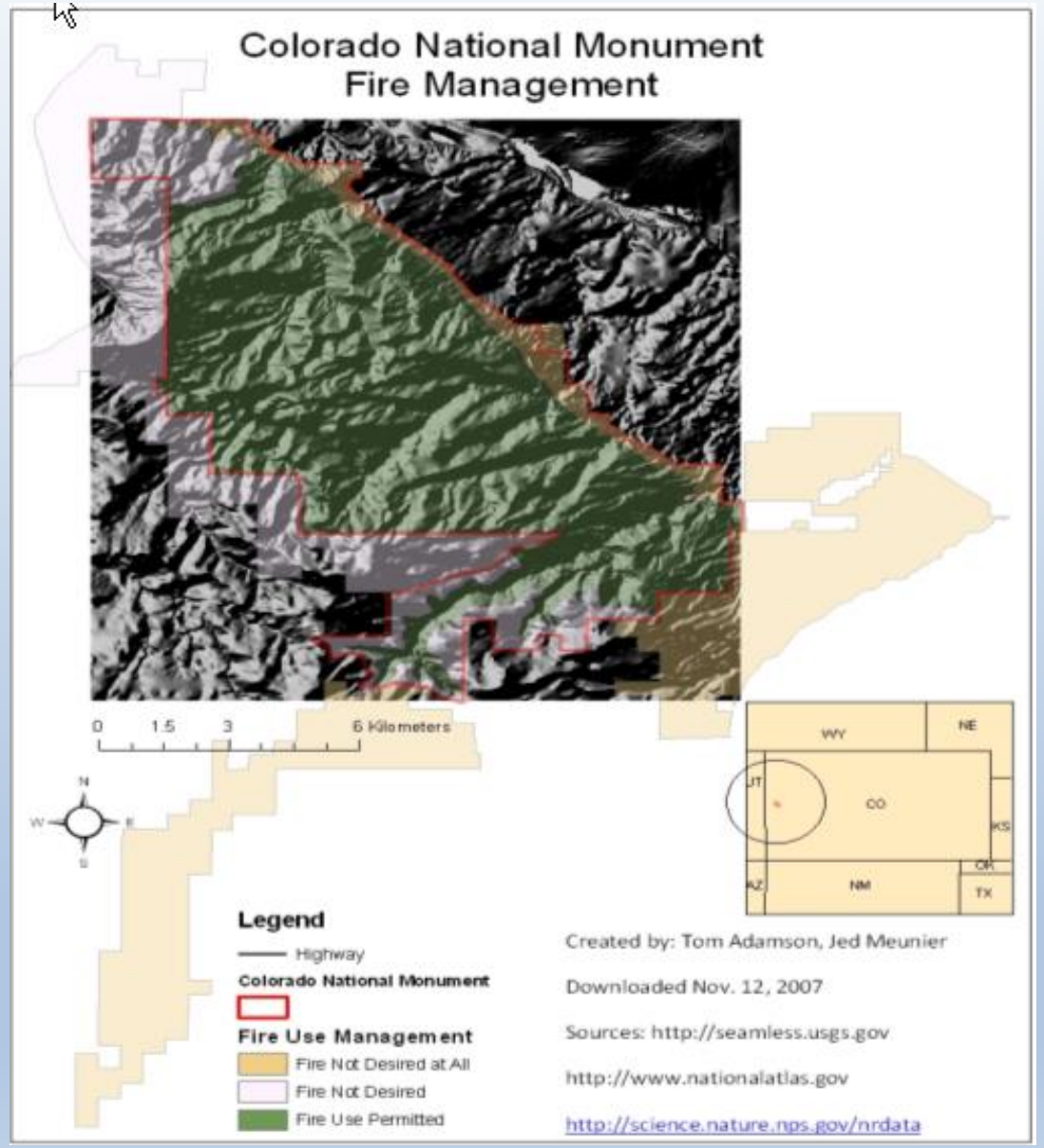
Describe the analysis (Flowcharts)



Results

Wildland Fire Use: Application of naturally ignited wildland fires to accomplish resource benefits in predefined geographic areas outlined in Fire

Management Plans.



Resources

- Proprietary

  ESRI ArcGIS (https://www.arcgis.com/features/)
- Open Source

  QGIS (http://www.qgis.org/en/site/)
- Top Ten GIS Software Products

  http://www.capterra.com/gis-software/
- OSGeo: The Open Source Geospatial Foundation

  http://www.osgeo.org/